

# How Effective Is Drug Abuse Resistance Education? A Meta-Analysis of Project DARE Outcome Evaluations

## ABSTRACT

**Objectives.** Project DARE (Drug Abuse Resistance Education) is the most widely used school-based drug use prevention program in the United States, but the findings of rigorous evaluations of its effectiveness have not been considered collectively.

**Methods.** We used meta-analytic techniques to review eight methodologically rigorous DARE evaluations. Weighted effect size means for several short-term outcomes also were compared with means reported for other drug use prevention programs.

**Results.** The DARE effect size for drug use behavior ranged from .00 to .11 across the eight studies; the weighted mean for drug use across studies was .06. For all outcomes considered, the DARE effect size means were substantially smaller than those of programs emphasizing social and general competencies and using interactive teaching strategies.

**Conclusions.** DARE's short-term effectiveness for reducing or preventing drug use behavior is small and is less than for interactive prevention programs. (*Am J Public Health.* 1994;84:1394-1401)

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### Introduction

School-based drug use prevention programs have been an integral part of the US antidrug campaign for the past two decades.<sup>1,2</sup> Although programs have proliferated, none is more prevalent than Project DARE (Drug Abuse Resistance Education).<sup>3</sup> Created in 1983 by the Los Angeles Police Department and the Los Angeles Unified School District, DARE uses specially trained law enforcement officers to teach a drug use prevention curriculum in elementary schools<sup>4</sup> and, more recently, in junior and senior high schools. Since its inception, DARE has been adopted by approximately 50% of local school districts nationwide, and it continues to spread rapidly.<sup>3</sup> DARE is the only drug use prevention program specifically named in the 1986 Drug-Free Schools and Communities Act. Some 10% of the Drug-Free Schools and Communities Act governors' funds, which are 30% of the funds available each fiscal year for state and local programs, are set aside for programs "such as Project Drug Abuse Resistance Education,"<sup>5</sup> amounting to much of the program's public funding.

Given its widespread use and the considerable investment of government dollars, school time, and law enforcement effort, it is important to know whether DARE is an effective drug use prevention program. That is, to what extent does DARE meet its curriculum objectives, most prominently "to keep kids off drugs"?

DARE's core curriculum, offered to pupils in the last grades of elementary school, is the heart of DARE's program and the focus of this study. We evaluate here the core curriculum's short-term effectiveness by using meta-analytic tech-

niques to integrate the evaluation findings of several studies.<sup>6,7</sup> We searched for all DARE evaluations, both published and unpublished, conducted over the past 10 years and selected for further review those studies that met specified methodological criteria. We calculated effect sizes as a method for establishing a comparable effectiveness measure across studies.<sup>7-9</sup> In addition, to put DARE in the context of other school-based drug use prevention programs, we compared the average magnitude of the DARE effect sizes with those of other programs that target young people of a similar age.

### DARE's Core Curriculum

The DARE core curriculum's 17 lessons, usually offered once a week for 45 to 60 minutes, focus on teaching pupils the skills needed to recognize and resist social pressures to use drugs.<sup>4</sup> In addition, lessons focus on providing information about drugs, teaching decision-making skills, building self-esteem, and choosing healthy alternatives to drug use.<sup>4</sup> DARE officers use teaching strategies, such as lectures, group discussions, question-and-

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answer sessions, audiovisual material, workbook exercises, and role-playing.<sup>4</sup>

The training that DARE officers receive is substantial. They are required to undergo 80 training hours in classroom management, teaching strategies, communication skills, adolescent development, drug information, and curriculum instruction.<sup>4</sup> In addition, DARE officers with classroom experience can undergo further training to qualify as instructors/mentors.<sup>4</sup> These officers monitor the program delivery's integrity and consistency through periodic classroom visits.

## Methods

### Identification of Evaluations

We attempted to locate all quantitative evaluations of DARE's core curriculum through a survey of DARE's five Regional Training Centers, computerized searches of the published and unpublished literature, and telephone interviews with individuals known to be involved with DARE. Eighteen evaluations in 12 states and one province in Canada were identified. Several evaluations were reported in multiple reports or papers. (See Appendix A for a bibliography of the studies considered.)

### Evaluation Selection Criteria

To be selected for this meta-analysis, an evaluation must have met the following criteria: (1) use of a control or comparison group; (2) pretest-posttest design or posttest only with random assignment; and (3) use of reliably operationalized quantitative outcome measures. Quasi-experimental studies were excluded if they did not control for preexisting differences on measured outcomes with either change scores or covariance-adjusted means.<sup>10</sup> In addition, to ensure comparability, we focused on results based only on immediate posttest. Because only four evaluation studies were long term (two of which were compromised by severe control group attrition or contamination), we were unable to adequately assess longer-term DARE effects.

We examined several other methodological features, such as the correspondence between the unit of assignment and analysis, the use of a panel design, matching of schools in the intervention and control conditions, and attrition rates. Although these factors were considered in assessing the studies' overall methodological rigor, we did not eliminate evaluations on the basis of these criteria.

## Data Analysis

For each study, we calculated an effect size to quantify the magnitude of DARE's effectiveness with respect to each of six outcomes that reflect the DARE curriculum's aims. An effect size is defined as the difference between the intervention and the control group means for each outcome measure, standardized by dividing by the pooled standard deviation [effect size =  $\text{mean}_I - \text{mean}_C / \text{SD}$ ].<sup>7-9</sup> If means and standard deviations were not available, we calculated effect sizes using formulas developed to convert other test statistics and percentages to effect sizes.<sup>9</sup> In all cases, we used statistics reflecting covariance-adjusted means, with pretest values as covariates rather than unadjusted means so that any differences between the comparison groups before the intervention would not be reflected in the effect sizes.<sup>10</sup>

The six outcome measure classes include knowledge about drugs, attitudes about drug use, social skills, self-esteem, attitude toward police, and drug use. Some studies did not include all six, and some outcomes were measured by more than one indicator. When multiple indicators were used (e.g., two measures of social skills), we calculated separate effect sizes and then averaged them.<sup>6,10</sup> This procedure yielded one effect size per study for each measured outcome type. In the one study that reported only that a measured outcome was not statistically significant (and did not provide any further statistics), we assigned a zero value to that effect size.<sup>10</sup> To calculate effect sizes for drug use, we considered only alcohol, tobacco, and marijuana use; we averaged effect sizes across these substances. In a supplementary analysis, we considered use of these substances separately. The prevalence of other drugs, such as cocaine, was too small to produce meaningful effects.

In addition to calculating one effect size per outcome per study, we calculated the weighted mean effect size and 95% confidence interval (CI) for each outcome type across programs. The weighted mean is computed by weighting each effect size by the inverse of its variance, which is a reflection of the sample size.<sup>8,9</sup> The effect size estimates from larger studies are generally more precise than those from smaller studies.<sup>8</sup> Hence, the weighted mean provides a less biased estimate than the simple, unweighted mean because estimates from larger samples are given more weight. The 95% CI indicates the

**TABLE 1—DARE Evaluation Studies Selected for Review**

Location	References <sup>a</sup>
British Columbia (BC)	Walker 1990
Hawaii (HI)	Manos, Kameoka, and Tanji 1986
Illinois (IL)	Ennett et al. 1994 (in press)
Kentucky-A (KY-A)	Clayton et al. 1991a, 1991b
Kentucky-B (KY-B)	Faine and Bohlander 1988, 1989
Minnesota (MN)	McCormick and McCormick 1992
North Carolina (NC)	Ringwalt, Ennett, and Holt 1991
South Carolina (SC)	Harmon 1993

<sup>a</sup>See Appendix A for full references.

estimated effect size's accuracy or reliability and is calculated by adding to or subtracting from the mean 1.96 multiplied by the square root of 1 divided by the sum of the study weights.<sup>8</sup>

### Comparison of DARE with Other Drug Use Prevention Programs

For comparison with DARE, we used the effect sizes reported in Tobler's meta-analysis of school-based drug use prevention programs.<sup>10</sup> To allow the most appropriate comparisons with DARE effect sizes, we obtained Tobler's results for only those programs (excluding DARE) aimed at upper elementary school pupils. These programs are a subset of 25 from the 114 programs in Tobler's meta-analysis, whose studies are referenced in Appendix B.

We selected this meta-analysis for comparison because of its greater similarity to ours than other meta-analyses of drug use prevention programs.<sup>11-14</sup> Tobler's studies met the same methodological standards that we used for the DARE studies. The only differences were that Tobler excluded studies that did not measure drug use and considered results from later posttests, whereas we considered only immediate posttest results. Neither of these differences, however, should seriously compromise the comparison.

The evaluation studies included in Tobler's meta-analysis are classified into

**TABLE 2—Sample and Methodological Characteristics of the DARE Evaluations (n = 8)**

Study	Schools, n	Subjects, n	Research Design	Matching	Unit of Analysis	Pretest Equivalency <sup>a</sup>	Scale Reliabilities	Attrition
BC	11	D = 287 C = 175	Quasi, cross-sectional	Yes	Individual	Yes	No	Not applicable
HI	26	D = 1574 C = 435	Quasi, panel	No	Individual	No	No	No
IL	36	D = 715 C = 608	Experimental/quasi, panel	Yes	School based	Yes	Yes	Yes <sup>b</sup>
KY-A	31	D = 1438 C = 487	Experimental, panel	No	Individual	Yes	Yes	Yes <sup>b</sup>
KY-B	16	D = 451 C = 332	Quasi, panel	Yes	Individual	Yes	Yes	No
MN	63	D = 453 C = 490	Quasi, panel	No	Individual	Yes	Yes	Yes <sup>c</sup>
NC	20	D = 685 C = 585	Experimental, panel	No	School based	Yes	Yes	Yes <sup>b</sup>
SC	11	D = 295 C = 307	Quasi, panel	Yes	Individual	Yes	Yes	Yes <sup>c</sup>

Note. See Table 1 for information on study locations and references. D = DARE; C = comparison.

<sup>a</sup>Pretest equivalency on demographic variables assessed and controlled if necessary.

<sup>b</sup>Attrition rates reported and differential attrition across experimental conditions analyzed.

<sup>c</sup>Attrition rates reported only.

**TABLE 3—Unweighted Effect Sizes Associated with Eight DARE Evaluations**

Study	Knowledge	Attitudes about Drugs	Social Skills	Self-Esteem	Attitude toward Police	Drug Use <sup>a</sup>
BC	.68	.00	...	...	...	.02
HI	...	.07	.34	...	...	...
IL	...	.03	.15	.15	.12	.05
KY-A	...	.11	.10	.07	...	.00
KY-B	.58	.19	.30	.14	.27	...
MN	.19	.06	.08	-.03	.05	...
NC	...	.19	.17	.00	...	.11
SC	...	.32	.19	.06	.08	.10

Note. See Table 1 for information on study locations and references.

<sup>a</sup>Limited to alcohol, tobacco, and marijuana.

evaluation are shown in Table 1, and study characteristics are summarized in Table 2.

Each evaluation represents a state or local effort. The number of student subjects in all studies was large, each study comprising at least 10 schools with approximately 500 to 2000 students. Although demographic information was not given for three studies, the remaining five studies in the sample primarily consisted of White subjects.

Assignment of DARE to intervention and control groups was by school for all eight studies. In one study, DARE also was assigned by classroom in certain schools.<sup>18</sup> Because of potential contamination in this study of the control group classrooms by their close proximity to DARE classes, we eliminated these control classrooms; only control schools with no DARE classes were included. Two studies used a true experimental design in which schools were randomly assigned to DARE and control conditions; a third study used random assignment for two thirds of the schools. The remaining five evaluations used a nonequivalent control group quasi-experimental design.

Because there were relatively few sampling units across studies—ranging from 11 to 63 schools, with all except one study involving fewer than 40 schools—it is unlikely that equivalence between

two broad categories based on the programs' content and process. Process describes the teaching approach (how the content is delivered). Programs classified by Tobler as "noninteractive" emphasize intrapersonal factors, such as knowledge gain and affective growth, and are primarily delivered by an expert. "Interactive" programs emphasize interpersonal factors by focusing on social skills and general social competencies and by using interactive teaching strategies, particularly peer to peer. Consistent with other meta-analyses showing that programs emphasizing social skills tend to be the most successful,<sup>11-13,15</sup> interactive programs pro-

duced larger effect sizes than noninteractive programs. We compared DARE with both categories of programs.

## Results

### Characteristics of Evaluations

Of the original 18 studies, 8 met the criteria for inclusion. One additional study met the methodological criteria but did not administer the first posttest until 1 year after DARE implementation; therefore, it could not be included in our analysis of immediate effects.<sup>16,17</sup> The location and primary reference for each

groups was obtained without prior matching or blocking of schools, even with randomization. Only half the studies matched comparison schools on selected demographic characteristics. Most studies (75%), however, assessed the equivalency of the comparison groups at pretest and made adjustments for pretest differences on demographic characteristics. All studies adjusted for pretest differences on outcome measures.

All but one study used a panel design that matched subjects from pretest to posttest with a unique identification code.

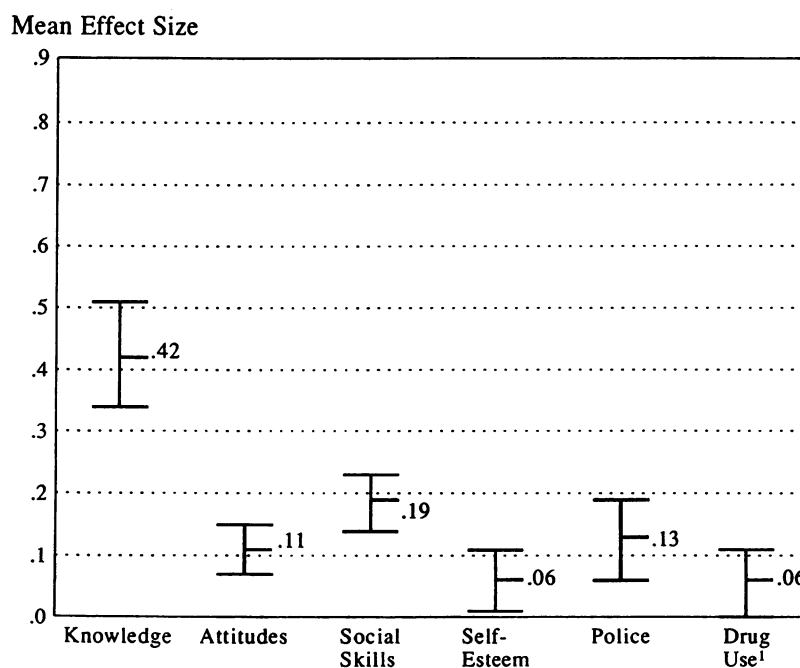
Outcome measures used in the DARE evaluations were based on responses to self-administered questionnaires. Seven studies used standardized scales or revised existing measures; six studies reported generally high scale reliabilities (usually Cronbach's alpha). Validity information, however, was rarely reported, and no study used either a biochemical indicator or "bogus pipeline" technique to validate drug use self-reports.<sup>19</sup>

Most studies (75%) did not use a data analysis strategy appropriate to the unit of assignment. Because schools, not students, were assigned to DARE and control conditions, it would have been appropriate to analyze the data by schools with subjects' data aggregated within each school or to use a hierarchical analysis strategy in which subjects are nested within schools.<sup>20,21</sup> Six studies ignored schools altogether and analyzed individual subjects' data, thereby violating the statistical assumption of independence of observations. Ignoring schools as a unit of analysis results in a positive bias toward finding statistically significant program effects.<sup>21</sup> This bias may be reflected in CIs reported for each outcome's weighted mean effect size.

Five studies reported generally small attrition rates. None of the three studies that analyzed attrition found that rates differed significantly across experimental and control conditions. In addition, subjects absent from the posttest were not more likely to be drug users or at risk for drug use. Although attrition usually is greater among drug users,<sup>22</sup> given the sample's young age (when school dropout is unlikely and drug use prevalence is low), these results are not surprising.

### DARE Effect Sizes

Study effect sizes are shown in Table 3. In general, the largest effect sizes are for knowledge and social skills; the smallest are for drug use.



<sup>1</sup>Drug use includes alcohol, tobacco, and marijuana.

**FIGURE 1—Magnitude of DARE's weighted mean effect size (and 95% CI), by outcome measure.**

Figure 1 shows the mean weighted effect size and 95% CI for each outcome based on the eight studies combined. The largest mean effect size is for knowledge (.42), followed by social skills (.19), attitude toward the police (.13), attitudes about drug use (.11), self-esteem (.06), and drug behavior (.06). The effect sizes for knowledge, social skills, attitude toward the police, attitudes about drug use, and self-esteem are statistically significant. The CI for the mean drug use effect size overlaps with zero (i.e., it is not significantly different from zero).

Because averaging alcohol, tobacco, and marijuana use for the drug use effect size could obscure substantial differences among the substances, we calculated DARE's mean weighted effect sizes separately for these substances. The weighted mean effect size for alcohol use is .06 (95% CI = .00, .12); for tobacco use, .08 (95% CI = .02, .14); and for marijuana use, -.01 (95% CI = -.09, .07). Only the mean for tobacco use is statistically significant.

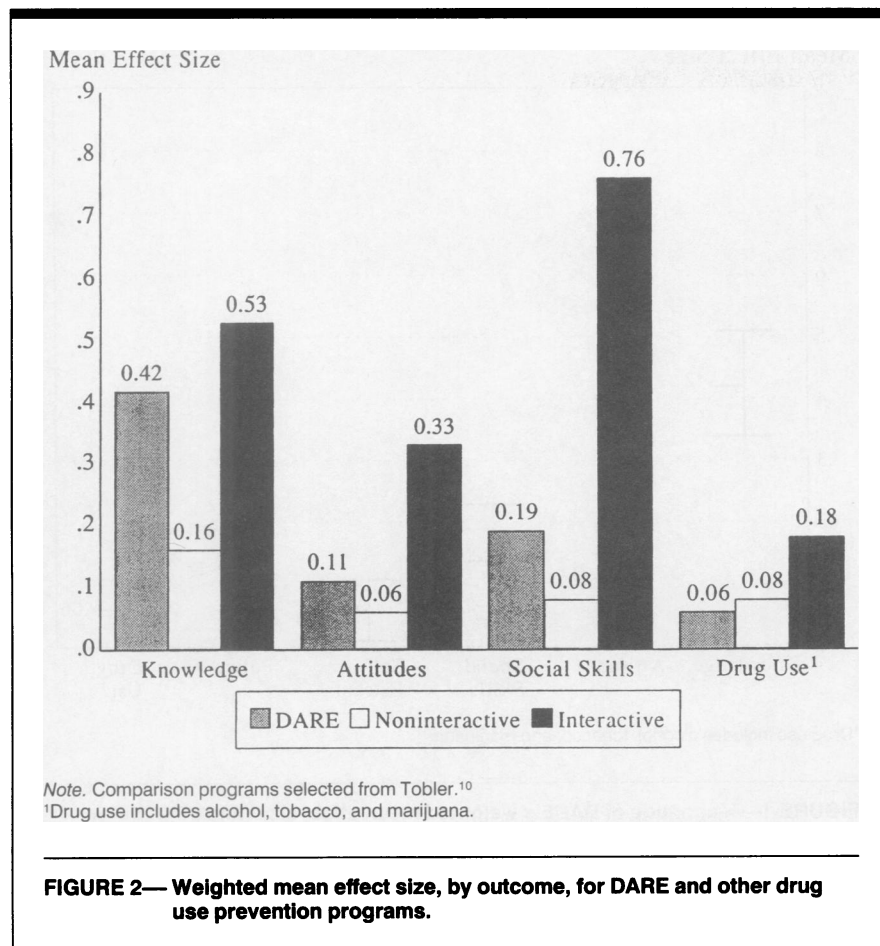
### Mean Effect Sizes for DARE vs Other Drug Use Prevention Programs

We compared by type of outcome the mean weighted DARE effect size with the

mean weighted effect size for noninteractive (n = 9) and interactive (n = 16) programs; effect sizes for the comparison programs are derived from Tobler.<sup>10</sup> The comparison programs target youth of the same grade range targeted by DARE. The outcomes assessed by both DARE and the comparison programs are knowledge, attitudes, social skills, and drug use behavior.

Across the four outcome domains, DARE's effect sizes are smaller than those for interactive programs (Figure 2). Most notable are DARE's effect sizes for drug use and social skills; neither effect size (.06 and .19, respectively) is more than a third of the comparable effect sizes for interactive programs (.18 and .75, respectively). DARE's effect size for drug use is only slightly smaller than the noninteractive programs' effect size. DARE's effect sizes for knowledge, attitudes, and social skills, however, are larger than those for noninteractive programs.

Comparison of effect sizes separately for alcohol, tobacco, and marijuana use shows that DARE's effect sizes are smaller than those for interactive programs (Figure 3). Except for tobacco use,



they also are smaller than those for noninteractive programs.

## Discussion

The results of this meta-analysis suggest that DARE's core curriculum effect on drug use relative to whatever drug education (if any) was offered in the control schools is slight and, except for tobacco use, is not statistically significant. Across the studies, none of the average drug use effect sizes exceeded .11. Review of several meta-analyses of adolescent drug use prevention programs suggests that effect sizes of this magnitude are small.<sup>10-14</sup>

The small magnitude of DARE's effectiveness on drug use behavior may partially reflect the relatively low frequency of drug use by the elementary school pupils targeted by DARE's core curriculum. However, comparison of the DARE effect sizes with those of other school-based drug use prevention programs for same-age adolescents suggests that greater effectiveness is possible with early adolescents. Compared with the programs classified by Tobler as interac-

tive, DARE's effect sizes for alcohol, tobacco, and marijuana use, both collectively and individually, are substantially less.<sup>10</sup> Except for tobacco use, they also are less than the drug use effect sizes for more traditional, noninteractive programs.

It has been suggested that DARE may have delayed effects on drug use behavior once pupils reach higher grades.<sup>23,24</sup> Longer-term follow-up studies are needed to test this possibility. Only four reviewed studies administered multiple posttests, and for two of these the results from some later posttests are uninterpretable. However, based on two experimental studies for which reliable information 1 and 2 years after implementation is available, there is no evidence that DARE's effects are activated when subjects are older.<sup>25,26</sup> Most long-term evaluations of drug use prevention programs have shown that curriculum effects decay rather than appear or increase with time.<sup>27,28</sup>

DARE's immediate effects on outcomes other than drug use were somewhat larger (especially for knowledge) and were statistically significant. These

effect sizes, however, also were less than the comparable effect sizes for same-age interactive programs. That DARE's effect sizes for knowledge, attitudes, and skills were greater in magnitude than those of noninteractive programs may not be particularly meaningful because many of these types of programs, such as programs using "scare tactics" or emphasizing factual knowledge about drug use, have been discredited as unsuccessful.<sup>29,30</sup>

Comparison of DARE's core curriculum content with the interactive and noninteractive programs' curricula may partially explain the relative differences in effect sizes among these programs. Interactive programs tend to emphasize developing drug-specific social skills and more general social competencies, whereas noninteractive programs focus largely on intrapersonal factors. Because DARE has features of both interactive and noninteractive programs, it is perhaps not surprising that the effect sizes we reported should fall somewhere in between. Perhaps greater emphasis in the DARE core curriculum on social competencies and less emphasis on affective factors might result in effect sizes nearer to those reported for interactive programs. However, it is difficult to speculate on the effect of adding or subtracting particular lessons to or from DARE's curriculum. Most school-based prevention program evaluations have assessed the effectiveness of an overall program rather than various program components or combinations of components.

Who teaches DARE and how it is taught may provide other possible explanations for DARE's limited effectiveness. Despite the extensive DARE training received by law enforcement officers, they may not be as well equipped to lead the curriculum as teachers. No studies have been reported in which the DARE curriculum was offered by anyone other than a police officer; results from such a study might suggest whether teachers produce better (or worse) outcomes among pupils.

Regardless of curriculum leader, however, the generally more traditional teaching style used by DARE has not been shown to be as effective as an interactive teaching mode.<sup>10,14</sup> Although some activities encourage pupil interaction, the curriculum relies heavily on the officer as expert and makes frequent use of lectures and question-and-answer sessions between the officer and pupils. In fact, it is in teaching style, not curriculum content, that DARE most differs from the interactive programs examined by Tobler.

The DARE core curriculum recently was modified to introduce more participatory activities, which may lead to greater program effectiveness.

Several limitations should be considered in evaluating our findings. The number of evaluations reviewed (eight) is not large when compared with the vast number of sites where DARE has been implemented. The consistency of results across studies, however, suggests that the results are likely to be representative of DARE's core curriculum. Even so, we would have preferred a full set of eight effect sizes for each outcome.

It is possible that the effect sizes for the DARE studies may have been attenuated compared with the drug use prevention programs reviewed by Tobler because the control groups were not pure "no treatment" groups. As documented by Tobler, effect sizes are lower when the control group receives some sort of drug education.<sup>10,14</sup> The DARE evaluations generally lacked information on alternative treatments received by the control groups, but it is likely that most control groups received some drug education because the studies occurred after the 1986 Drug-Free Schools and Communities Act. However, approximately half (54%) of the programs reviewed by Tobler also were conducted between 1986 and 1990, suggesting that they may suffer from the same effect.<sup>10</sup>

Most of the drug use prevention programs evaluated by Tobler were university research-based evaluation studies, whereas DARE is a commercially available curriculum. Although the magnitude of the resources invested in DARE is considerable, the intensity of effort devoted to smaller-scale programs may be greater. Some diminished effectiveness is perhaps inevitable once programs are widely marketed.

Although we found limited immediate core curriculum effects, some features of DARE may be more effective, such as the middle school curriculum. In addition, DARE's cumulative effects may be greater in school districts where all DARE curricula for younger and older students are in place. Other DARE outcomes, such as its impact on community law enforcement relations, also may yield important benefits. However, due to the absence of evaluation studies, consideration of these features is beyond this study's scope.

DARE's limited influence on adolescent drug use behavior contrasts with the program's popularity and prevalence. An

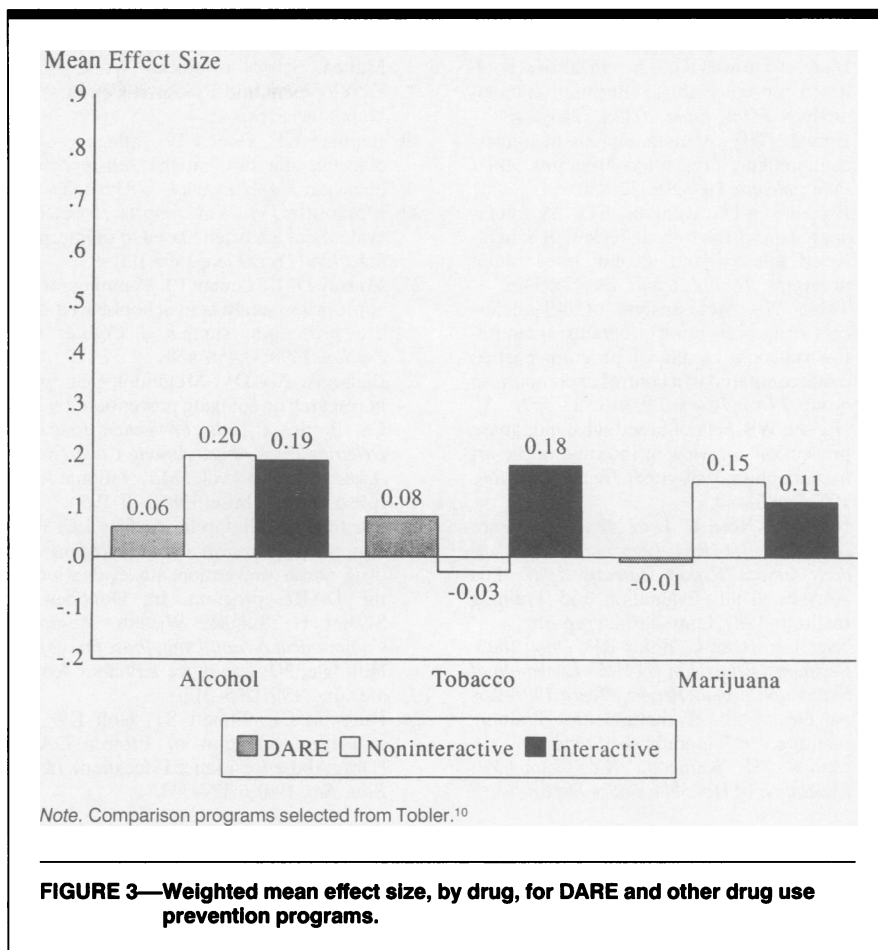


FIGURE 3—Weighted mean effect size, by drug, for DARE and other drug use prevention programs.

important implication is that DARE could be taking the place of other, more beneficial drug use curricula that adolescents could be receiving. At the same time, expectations concerning the effectiveness of any school-based curriculum, including DARE, in changing adolescent drug use behavior should not be overstated.<sup>31</sup> □

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